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APPLICANTS:	Peng J. ZHANG	CONF. NO.:	3637
SERIAL NO.:	09/615,945	GROUP:	2626
FILED:	July 13, 2000	EXAMINER:	Michael N. Opsasnick
FOR:	METHOD AND APPARATUS FOR DISCRIMINATING SPEECH FROM VOICE-BAND DATA IN A COMMUNICATION NETWORK		

APPELLANT'S BRIEF ON APPEAL UNDER 37 C.F.R. § 41.37

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Sir:

In accordance with the provisions of 37 C.F.R. §41.37, Appellant submits the following:

I. REAL PARTY IN INTEREST:

The real party in interest is Alcatel-Lucent.

II. RELATED APPEALS AND INTERFERENCES

A Notice of Appeal was filed on November 16, 2006 and an Appeal Brief was filed on February 16, 2006 for the present application. In

response to the February 16, 2006 Appeal Brief, an Office Action was mailed on June 22, 2007, which withdrew the finality of the previous Office Action and which withdrew the 35 U.S.C. § 103 rejection previously contested by the February 16, 2006 Appeal Brief. The 35 U.S.C. § 101 rejection contested in the present Appeal Brief is not related to the 35 U.S.C. § 103 rejection argued in the February 16, 2006 Appeal Brief.

III. STATUS OF CLAIMS:

Claims 1-21 are pending; with claims 1 and 11 being written in independent form.[1]

Claims 1-21 stand finally rejected under 35 U.S.C. § 101 as allegedly being directed to non-statutory matter.[2]

Claims 1-21 are being appealed.

IV. STATUS OF AMENDMENTS:

No amendments were filed after the Final Office Action mailed December 5, 2007.

[1] See page 2 of the December 5, 2007 Final Office Action.
[2] See page 2 of the December 5, 2007 Final Office Action.

V. SUMMARY OF CLAIMED SUBJECT MATTER:

A. Concise explanation of the subject matter set forth in each of independent claims 1 and 11.

1. A general discussion of the subject matter of the application to assist the board of appeals in understanding example embodiments of the present application.

Generally, independent claim 1 reads on methods for discriminating speech from voice-band data in a communication network as illustrated, for example, in FIGS. 2-3C. Independent claim 11 reads on apparatuses for discriminating speech from voice-band data in a communication network as illustrated, for example, in FIGS. 1-3C.

Typically, voiced speech is characterized by relatively high energy content and periodicity, i.e., "pitch", while unvoiced speech exhibits little or no periodicity. Transition regions which occur between voiced and unvoiced speech regions often have characteristics of both voiced and unvoiced speech. During normal transmission, high-speed voice-band date (VBD) is scrambled, encoded, and modulated, thereby appearing as noise with no periodicity. Some low-speed VBD signals, such as control signals used during a start-up procedure, exhibit periodicity. Example embodiments discriminate between periodic speech and VBD signals by recognizing that periodic VBD signals will typically have a faster repetition rate than voiced speech, and calculating short-

term delay and long-term delay self similarity ratio (SSR) values to indicate the repetition rate of an input signal frame.[3]

Example embodiments also recognize that analyzing the periodicity characteristics of an input frame may not ensure accurate speech/VBD discrimination, and that certain spectral characteristics of an input frame may reveal whether the input frame is speech or VBD. For example, the carrier frequency used by a typical modem/fax is within a narrow range, whereas speech is a non-stationary random signal that typically exhibits large variations in its power spectrum. Example embodiments calculate short-term autocorrelation coefficients to determine the spectral envelope of an input frame to facilitate accurate speech/VBD discrimination.[4]

Fig. 1 of the present application is a general block diagram of an apparatus for discriminating speech from VBD signals in accordance with example embodiments. As shown in Fig. 1, the speech/VBD discriminator 100 includes an input frame buffer 110, a high-pass filter 120, and a speech/VBD discriminating unit 130. The input frame buffer 110 receives an input signal (e.g., from a network line card which samples the signal from a conventional telephone network channel at an 8 kHz clock rate) to buffer frames of N consecutive speech samples per frame. Nominally, the input signal received by the input frame buffer has been sampled at an 8 kHz clock rate, frame size is

[3] See page 2, line 20 – page 3, line 2 of the originally filed application.
[4] See page 3, lines 3 – 12 of the originally filed application.

in the range of 10 milliseconds (i.e., $N = 80$ samples at a 8 kHz sampling rate) to 30 milliseconds (i.e., $N = 240$ samples at a 8 kHz sampling rate), and a 16-bit linear binary word represents the amplitude of an input sample (i.e., an input sample is no more than 2^{15}). The high-pass filter 120 filters each frame of N samples to remove DC components there-from.[5]

The speech/VBD discriminating unit 130 calculates short-time power, *Ps*, of an input frame using a window of N samples. The speech/VBD discriminating unit 130 also calculates SSR values to measure the similarity between sequential signal segments (SSR1 and SSR2). [6] The speech/VBD discriminating unit 130 also calculates autocorrelation coefficients (R2d, R3d, and R4d), which represent certain spectral characteristics of the frame of interest.[7]

Fig. 2 of the present application illustrates a "raw decision" sequence for classifying a single input frame as being either speech or VBD. After calculating the *Ps*, *SSR1*, *SSR2*, *R2d*, *R3d*, and *R4d* values discussed above (step 150), the speech/VBD discriminating unit 130 initially attempts to classify the frame of interest as either speech or VBD based on *R2d* (step 152).[8]

If *R2d* is between *TR2L* and *TR2H*, then the speech/VBD discriminating unit 130 next attempts to achieve a discrimination result based on *SSR1* (step

[5] See page 4, line 17 – page 5, line 10 of the originally filed application.
[6] See page 6, lines 17 – 23 of the originally filed application.
[7] See page 7, lines 16 – 18 of the originally filed application.
[8] See page 9, lines 19 – 24 of the originally filed application.

158). If *SSR1* is less than *TS1*, the speech/VBD discriminating unit 130 next attempts to discriminate based on *R3d* and *R4d* (step 162).[9]

If none of these conditions are met, the speech/VBD discriminating unit 130 next attempts to discriminate based on *SSR2* (step 166). [10]

The speech/VBD discrimination technique described above is implemented in a sequential decision logic algorithm in accordance with example embodiments to improve decision reliability. [11]

Figs. 3A-3C of the present application are flowcharts which illustrate an exemplary sequential decision logic algorithm implemented by the speech/VBD discriminating unit 130 to discriminate speech and VBD. The sequential decision logic algorithm illustrated in Figs 3A-3C essentially has six states: (1) an initialization state; (2) a determination state in which individual input frames are classified as being either speech or VBD; (3) a speech state in which the classification result remains speech until subsequent classification results indicate that the speech state is erroneous; (4) a "was speech" state in which a period of low-power occurs after entering the speech state; (5) a VBD state in which the classification result remains VBD until subsequent classification results indicate the VBD state is erroneous; and (6) a "was VBD" state in which a period of low-power occurs after entering the VBD state. The significance of

[9] See page 9, line 28 – page 10, line 4 of the originally filed application.
[10] See page 10, lines 9 – 10 of the originally filed application.
[11] See page 10, lines 15 – 18 of the originally filed application.

these classification states will become more apparent from the following description.[12]

Referring to Fig. 3A of the present application, during an initialization step, each counter used in the sequential decision algorithm is set to 0 (step 202). Next, the discriminating unit 130 calculates *Ps* for a frame of interest (step 204) and determines whether *Ps* is greater than or equal to an energy threshold *ETh1* (step 206). When *Ps* is less than *ETh1*, the discriminating unit does not attempt to determine whether the frame is speech or VBD, and instead returns to step 204 to calculate the *Ps* for the next frame. In other words, the discriminating unit 130 does not initially attempt to classify input frames as speech or VBD until *Ps* reaches *ETh1*. The sequential decision logic algorithm remains in an initialization state until *Ps* reaches *ETh1*.[13]

When the discriminating unit 130 determines that *Ps* is greater than or equal to *ETh1*, the sequential decision logic algorithm enters a determination state in which the speech/VBD discriminating unit 130 calculates discrimination feature values for the frame of interest (step 208) and decides whether these discrimination feature values indicate that the frame of interest is speech or VBD (step 210). In other words, the discriminating unit 130 executes the raw decision logic discussed above with reference to Fig. 2 to classify the frame of interest as speech or VBD. When the frame of interest is

[12] See page 10, line 19 – page 11, line 3 of the originally filed application.
[13] See page 11, lines 4 – 13 of the originally filed application.

classified as speech, a speech counter *Spc* is incremented by 1 (step 212), and *Spc* is compared to a speech count threshold *Spy*, e.g., *Spy* = 1 (step 214). If *Spc* is less than *Spy*, the sequential decision logic remains in the determination state and the discriminating unit 130 computes the discrimination feature values for the next input frame (step 208). If *Spc* is at least equal to *Spy*, the sequential decision logic enters the speech state, which is described below with reference to Fig. 3B.[14]

If, at step 210, the input frame is classified as VBD, a VBD counter *Mdc* is incremented by 1 (step 216), and *Mdc* is compared to a VBD count threshold *Mdy, e.g., Mdy* = 4. If *Mdc* is less than *Mdy*, the sequential decision logic remains in the determination state, and the discriminating unit 130 computes the discrimination feature values for the next frame (step 208). If *Mdc* is at least equal to *Mdy*, the sequential decision logic enters the VBD state, which is discussed in detail below with reference to Fig. 3C. In accordance with the sequential decision logic shown in Fig. 3B, after a predetermined number of frames have been classified as speech/VBD based on SSR and/or autocorrelation coefficient values so that the sequential decision logic algorithm enters the speech/VBD state, speech/VBD discrimination output does not change unless a certain number of subsequent classification results indicate that the speech/VBD state is erroneous.[15]

[14] See page 11, line 14 – page 11, line 29 of the originally filed application.
[15] See page 12, lines 1 – 14 of the originally filed application.

Referring to Fig. 3B of the present application, when the sequential decision logic enters the speech state (step 230), *Ps* is calculated for the next frame (step 204) and compared with the energy threshold *ETh1* (step 234). If *Ps* is at least equal to *ETh1*, a silence counter *Sic* is set equal to 0 (step 236), and the speech/VBD discriminating unit 130 calculates discrimination feature values for the next frame (step 238) so that the input frame can be classified as speech or VBD (step 240), i.e., "raw decision" is performed. If the input frame is classified as speech at step 240, the VBD counter *Mdc* is divided by 2 (step 242), the sequential decision logic remains in the speech state, and the classification sequence returns to step 232 so that the discriminating unit 130 calculates *Ps* for the next frame. If the input frame is recognized as VBD at step 240, the VBD counter *Mdc* is incremented by a "power-compensated" increment *x* (described in detail below) (step 244), and *Mdc* is compared with the VBD state-change threshold *Mdx*, e.g., *Mdx* = 8 (step 246). If *Mdc* is not at least equal to *Mdx*, the sequential decision logic remains in the speech state, and the decision sequence returns to step 232 so that the speech/VBD discriminating unit 130 calculates *Ps* for the next frame. When, however, *Mdc* is at least equal to *Mdx*, the VBD counter *Mdc* is reset to 0 (step 248), and the sequential decision logic switches to the VBD state.[16]

When the speech/VBD discriminating unit 130 determines at step 234 that *Ps* is less than *ETh1*, the silence counter *Sic* is incremented by 1 (step 250)

[16] See page 12, line 15 – page 13, line 5 of the originally filed application.

and compared to a silence counter threshold *Siy*, e.g., *Siy* =8, (step 252). If *Sic* has not reached *Siy*, the sequential decision logic remains in the speech state, and proceeds to step 238 so that the discriminating unit 130 computes discrimination values for the frame of interest. When *Sic* reaches *Siy*, however, the sequential decision logic enters a "was speech" state which will next be described with reference to flow diagram blocks 253-257. During the "was speech" state, the discriminating unit 130 initially calculates *Ps* for the next frame (step 253), and compares *Ps* with the energy threshold *ETh1* (step 254). If *Ps* is greater than or equal to *ETh1*, the silence counter *Sic* is reset to 0 (step 255) and the sequential decision logic returns to the speech state in step 238. When the discriminating unit 130 determines that *Ps* is less than *ETh1* at step 254, the silence counter *Sic* is incremented by 1 (step 256) and *Sic* is compared to a second silence counter threshold *Six* (step 257), e.g., *Six* = 200. If *Sic* has not reached *Six*, the sequential decision logic remains in the "was speech" state, and *Ps* is calculated for the next frame at step 253. When *Sic* reaches *Six*, however, the sequential decision logic returns to its initialization state at step 202, i.e., reset occurs.[17]

Referring next to Fig. 3C of the subject application, it can be seen that the sequential decision logic operates during the VBD state in a similar manner to the speech state described above with regard to Fig. 3B. As such, additional

[17] See page 13, lines 6 – 25 of the originally filed application.

discussion will be omitted herein for the sake of brevity. Associated discussion and a more detailed description of FIG. 3C may be found in the specification.[18]

2. The following explains the subject matter set forth in each independent claim referring to the specification by page and line number, and to the drawings, if any, by reference characters in accordance with 37 C.F.R. § 41.37(c)(1)(v).

Claim 1 is directed to a method of discriminating speech from voice-band data (VBD) in a communication network.[19] The method of claim 1 includes calculating a self similarity ratio (SSR) value representing a periodicity characteristic. This reads on, for example, equations 3-5 and 7, where a SSR may be calculated by the following equation (3).[20]

$$SSR_1(n) = Max\{COL(n,j)\} \qquad (3)$$

In equation (3), n is the frame number, j is the sample delay. $COL(n,j)$ is calculated by the following equation (4).[21]

[18] See page 13, line 26 – page 16, line 18 of the originally filed application.
[19] See element 130 in FIG. 1 and "Speech" and "VBD" in FIG. 2 of the originally filed application.
[20] See element 150 of FIG. 2; element 208 of FIG. 3A; element 238 of FIG. 3B; element 268 of FIG. 3C; page 6, lines 20-25, page 7, lines 1-8, equations 3, 4, 5 and 7 at pages 6-8 of the originally filed application.
[21] *Id.*

$$COL(n,j) = \frac{\sum_{i=n\cdot(N-1)}^{n\cdot N-1} x(i)\cdot x(i-j)}{\sum_{i=n(N-1)}^{n\cdot N-1} x(i-j)\cdot x(i-j)} \quad (4)$$

In equation (4), *x(i)* is the amplitude of sample *i* and *N* is the number of consecutive samples.[22]

The method of claim 1 further includes calculating an autocorrelation coefficient value representing a spectral characteristic. This reads on, for example, equations 2 and 6-10, where an autocorrelation coefficient value may be calculated by the following equation (6).[23]

$$Rkd\,(n) = \frac{1}{N\cdot P_s(n)}\cdot \sum_{i=n\cdot(N-1)}^{n\cdot N-1} x(i)\cdot x(i-k) \quad (6)$$

In equation (6), *k* sample is the sample delay, *N* is the number of consecutive samples. The short-time power, *Ps*, of an input frame using a window of *N* samples is calculated by the following equation (2).[24]

$$P_s(n) = \frac{1}{N}\cdot \sum_{i=n\cdot(N-1)}^{n\cdot N-1} x(i)\cdot x(i) \quad (2)$$

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22 *Id.*
23 *Id.*
24 *Id.*

As set forth in the method according to claim 1, calculating the self similarity ratio value includes calculating a plurality of different self similarity ratio values and selecting the highest one of the plurality of different self similarity ratio values as the calculated self similarity ratio value.[25] This reads on, for example, equations (3) and (5), which respectively calculate SSR_1, as shown above, and SSR_2, which is calculated similarly to SSR_1.[26] The method of claim 1 further includes determining whether said input signal segment is speech or voice-band data[27] based on said at least one of said self similarity value and said autocorrelation coefficient value. This reads on, for example, elements 152, 158, 162, and 166 of FIG. 2, which compare at least on the self similarity value and said autocorrelation coefficient value to a threshold.[28]

Claim 11 is directed to apparatus for discriminating speech from voice-band data in a communication network.[29] The apparatus reads on, for example, speech/VBD discriminating unit 130 of Fig. 1.[30] The apparatus of claim 11 includes calculating means[31] for calculating a self similarity ratio

[25] See pages 6-7, equations 3-5 of the originally filed application.
[26] See page 6, line 20 – page 7, line 8 and "SSR1" and "SSR2" of equations 3 and 5 of the originally filed application.
[27] See "SPEECH" and "VBD" of FIG. 2 of the originally filed application.
[28] See elements 152, 158, 162, and 166 of FIG. 2; element 210 of FIG. 3A; element 240 of FIG. 3B; and element 270 of FIG. 3C of the originally filed application.
[29] See FIGS. 1 and 2 of the originally filed application.
[30] See unit 130 of FIG. 1 of the originally filed application.
[31] See page 4, lines 20-28, of the originally filed application, where a speech/VBD discriminator may be implemented by a variety of physical network interface devices such as an "ATM trunking device or an IP-telephone network gateway" which may include discrete physical

value, representing a periodicity characteristic, and an autocorrelation coefficient value, representing a spectral characteristic. This reads on, for example, equations 2-10, some of which are shown above, and may be implemented by the speed/VBD discriminating unit 130.[32] As set forth in claim 11, calculating the self similarity ratio value includes calculating a plurality of different self similarity ratio values[33] and selecting the highest one of the plurality of different self similarity ratio values as the calculated self similarity ratio value. This reads on, for example, equations (3) and (5), which are explained above, and may also be implemented by the speech/VBD discriminating unit 130.[34] The apparatus of claim 11 further includes determining means[35] for determining whether said input signal segment is speech or voice-band data[36] based on said at least one of said self similarity value and said autocorrelation coefficient value. This reads on, for example,

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components such as Digital Signal Processors (DSP), programmable logic devices, or integrated circuits.

[32] See element 150 of FIG. 2; element 208 of FIG. 3A; element 238 of FIG. 3B; element 268 of FIG. 3C; page 6, lines 20-25, page 7, lines 1-8, equations 3, 4, and 5 at pages 6-7; page 7, lines 16-26 and equations 6-10 at page 8, lines 1-18 of the originally filed application.

[33] See pages 6-7, equations 3-5 of the originally filed application.

[34] See page 6, line 20 – page 7, line 8 and "SSR1" and "SSR2" of equations 3 and 5 of the originally filed application.

[35] See page 4, lines 20-28, of the originally filed application, where a speech/VBD discriminator may be implemented by a variety of physical network interface devices such as an "ATM trunking device or an IP-telephone network gateway" which may include discrete physical components such as Digital Signal Processors (DSP), programmable logic devices, or integrated circuits.

[36] See "SPEECH" and "VBD" of FIG. 2 of the originally filed application.

elements 152, 158, 162, and 166 of FIG. 2, which compare at least one of the self similarity value and said autocorrelation coefficient value to a threshold.[37]

VI. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL:

Appellant seeks the Board's review of the rejection of claims 1-21 under 35 U.S.C. §101 as allegedly being directed to non-statutory subject matter.

Claims 1-21 are being appealed.

Claims 1-10 and 21 rise and fall together.

Claims 11-20 rise and fall together.

[37] See elements 152, 158, 162, and 166 of FIG. 2; element 210 of FIG. 3A; element 240 of FIG. 3B; element 270 of FIG. 3C of the originally filed application.

VII. ARGUMENT.

Appellant requests the Board reverse the Examiner's rejection of claims 1-21 as being directed to non-statutory subject matter under 35 USC § 101. In support of Appellant's request, the following arguments are submitted.

A. The subject matter of claims 1-21 falls into at least one enumerated statutory category of subject matter under 35 USC § 101.

An invention may be generally defined according to four categories: "processes, machines, manufactures and compositions of matter."[38] The categories of machines, manufactures and composition may be defined as "products."[39] The "term 'process' means process, art, or ***method***" [emphasis added].[40] For products, the claim limitations generally relate to ***structural entities,***[41] while for processes the claims do not generally relate to structural entities but rather ***steps*** or acts to be performed.[42]

Claims written in a means-plus-function format are interpreted to read on the structures or materials disclosed in the ***specification*** and equivalents thereof that correspond to the recited function.[43]

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[38] See 35 U.S.C. § 101.
[39] See *Caterpillar Inc. v. Detroit Diesel Corp.*, 961 F. Supp. 1249, 1252 (N.D. Ind. 1996), *aff'd*, 194 F.3d 1336 (Fed. Cir. 1999) (unpublished).
[40] See 35 U.S.C. § 100(b)
[41] See *Caterpillar*, 961 F. Supp. at 1252.
[42] *NTP, Inc. v Research in Motion, Ltd.*, 418 F.3d 1282, 1318, 1322 (Fed. Cir. 2005).
[43] See 35 U.S.C. § 112, Para. 6; *In Re Donaldson Co.*, 16 F.3d 1189 (Fed. Cir. 1994) (en banc).

Claims 1-21 include two sets of claims, with claims 1 and 11 being the independent claims. Claim 1 relates to a "***method*** of discriminating speech from voice-band data in a communication network," with claims 2-10 depending therefrom. Claim 1 further recites a "calculating" step and a "determining" step. Therefore, as method claim 1 is a "method" and defines steps or acts to be preformed, method claim 1 falls under the category of "processes."

Claim 11 relates to an "***apparatus*** for discriminating speech from voice-band data in a communication network." Claim 11 further recites a "calculating ***means***" and a "determining ***means***." The present application also states that example embodiments may be implemented by a variety of ***physical*** network interface devices such as an "ATM trunking device or an IP-telephone network gateway." [44] These devices include the speech/VBD discriminator unit 100 (as shown in Fig. 1), which is the "calculating means" and "determining means" of claim 11, and may be implemented in a variety of ways such as in "a Digital Signal Processor (DSP), in programmable logic devices, in application specific integrated circuits, or a combination of such devices."[45] Therefore, as apparatus claim 11 includes "means" having structural support in the present application, apparatus claim 11 falls under the category of "products."

[44] See page 4, lines 20-28 of the originally filed application.
[45] See page 4, lines 20-28 of the originally filed application.

As such, method claims 1-10 clearly fall under at least the category of processes and claims 11-21 clearly fall under at least the category of products, and in particular, the category of machines. Accordingly, Appellant respectfully request reconsideration and withdrawal of the rejection to claims 1-21 under 35 U.S.C. § 101.

B. Even if the USPTO alleges a *prima facie* case that the subject matter of claims 1-21 falls outside an enumerated statutory category, the subject matter of claims 1-21 is still directed to a 35 USC § 101 judicial exception and therefore statutory.

Regardless of whether the Examiner alleges a *prima facie* case that the claims do not fall within one of the above enumerated statutory categories, the Examiner must still determine whether the claims cover either a 35 USC § 101 judicial exception or a practical application of a 35 USC § 101 judicial exception.[46] More particularly, for a claim including such excluded subject matter to be eligible for patent protection, the claim must be for a ***practical application*** of the abstract idea, law of nature, or natural phenomenon.[47] One example of an abstract idea would be a "mathematical algorithm."[48]

Claims are directed to a practical application of a 35 U.S.C. § 101 judicial exception when the subject matter of the claims **either** (1) "transforms" an article or object to a different state or thing **or** (2) otherwise produces "a useful,

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[46] *See Diamond v. Diehr*, 450 U.S. 175, 187, 209 (1981) ("application of a law of nature or mathematical formula to a known structure or process may well be deserving of patent protection"); MPEP § 2106 IV.B.-C.
[47] *Id.*
[48] See *In re Alappat*, 33 F.3d 1526, 1543 (Fed. Cir. 1994).

concrete and tangible result."[49] As discussed below, the subject matter of claims 1-21 meets at least one of the above requirements and therefore is directed towards a practical application under 35 U.S.C. § 101.

1. The subject matter of claims 1-21 involves a physical transformation and therefore is directed towards a practical application under 35 U.S.C. § 101.

A physical transformation "is not an invariable requirement, but merely one example of how a mathematical algorithm may bring about a useful application."[50] As the Supreme Court noted in *Diamond*, "transforming or reducing an article to a different state or thing...satisfies the requirements of Section 101."[51] However, the modern trend in courts has been to focus less on the physical aspect and more on the usefulness of the claimed invention in determining whether the requirements of 35 USC § 101 are met. This is further supported by the court in *AT&T*, which states that "physical limitations analysis seems of little value".[52] For example, under the modern standard for applying the law to the facts, "data transformations" are "useful, concrete and tangible," not "abstract."[53]

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[49] See *State Street Bank and Trust v Signature Financial Group Inc.*, 149 F.3d 1368, 1373 (Fed Cir 1998) citing *Alappat*, 33 F.3d at 1544; *AT&T Corp. v Excel Communications Inc.*, 172 F 3d 1352, 1360-61 (Fed Cir 1999).
[50] See *AT&T*, 172 F.3d at 1358-59.
[51] *Diamond*, 450 U.S. at 192; *AT&T*, 172 F.3d at 1359.
[52] *AT&T*, 172 F.3d at 1359.
[53] See *In re Schrader*, 22 F.3d 290, 295 (Fed. Cir. 1994) (stating that pure information may be patentable subject matter: "Thus, it is apparent that changes to intangible subject matter representative of or constituting physical activity or objects are included in the definition").

Moreover, data transformation is inherently a physical transformation. For instance, "data" cannot exist without being stored on some form of "physical" substrate – either a memory substrate (magnetic, optical, DNA, etc.), or energy propagating as modulated by the data. Also, information cannot be transformed or destroyed without expenditure of energy and increase in entropy, both of which are physical transformations. Therefore, "transformation of data" necessarily involves a "physical transformation."

For example, the court in *Arrhythmia* held that the ***transformation of heart signals into a mathematical algorithm are a practical application*** of a judicial exception and thus statutory under 35 USC § 101.[54] The claims in *Arrhythmia* were directed to "analyzing electrocardiograph signals to determine the presence or absence of a predetermined level of high-frequency energy in the late QRS signal," where the output was a number ***representing "a measure in microvolts of a specified heart activity."***[55] More specifically, comparing the "resulting output to a predetermined level" indicated "whether the patient is at high risk for ventricular tachycardia."[56] Thus, the court in

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[54] *Arrhythmia Research Tech. Inc. v. Corazonix Corp.*, 958 F.2d 1053, 1059-1060 (Fed. Cir. 1992). See also *In re Alappat*, 33 F.3d 1526 (Fed. Cir. 1994) (holding that data transformed by a mathematical algorithm to produce a smooth waveform display constituted a practical application and was thus statutory under 35 USC §101).
[55] *Arrhythmia*, 958 F.2d at 1059-1060.
[56] *Id.* at 1059.

Arrhythmia determined that the "resultant output is not an abstract number, but is a ***signal related to the patient's heart activity.***"[57]

Moreover, in reviewing the method claims, the court in *Arrhythmia* held that the "claimed steps of 'converting', 'applying', 'determining', and 'comparing' are ***physical*** process steps that ***transform*** one physical, electrical ***signal*** into another," where the converting includes "filtering" [emphasis added].[58] The court in *Arrhythmia* further clarified that the "***view that 'there is nothing necessarily physical about signals' is incorrect.***"[59] The decision by the court in *Arrhythmia* was reaffirmed in *AT&T*, which reiterated that the method claims of *Arrhythmia* qualified as statutory subject under 35 USC § 101 because "the steps transformed ***physical, electrical signals*** from one form into another form – a number ***representing a signal related to the patient's heart activity***, a non-abstract output" [Emphasis added].[60] That is, the number in *Arrhythmia* represented a physical thing – heart activity. That "the claimed process ***'transformed' data from one 'form' to another***" merely confirmed to the court that the method claims of *Arrhythmia* qualified as statutory subject under 35 USC § 101.[61]

The court in *Arrhythmia* held similarly for the apparatus claims stating that the "operations ***transform*** a particular ***input signal to a different***

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[57] *Id.*
[58] *Id.*
[59] *Id.*
[60] *AT&T*, 172 F.3d at 1359.
[61] *Id.*

output signal" [emphasis added].[62] More specifically, the apparatus claim 7 also included "means for" language.[63] The court in *Arrhythmia* found ***physical electronic devices*** disclosed in the specification corresponding to the "means," such as a "converter," "minicomputer" and "disc memory unit."[64] In *Alappat,* the court also found an independent claim written in a means-plus-function format to be statutory under 35 USC § 101 where the claim was related to creating a smooth waveform display in a digital oscilloscope and included "means for determining" and "means for normalizing."[65] Further the court reaffirmed the *Alappat* decision in *Schlafly*, where the means-plus-function claim included terminals encoding and decoding according to a numerical calculation algorithm.[66] Specifically, the court stated in *Schlafly* that "claims written in means-plus-function format contain ***statutory subject matter even if functional phrases of the means limitations recite mathematical calculations***."[67]

As discussed above, claims 1-21 of the present application relate to "discriminating speech from voice-band data in a communication network," using at least one of a "calculating" and "determining" means or steps. For example, claims 1 and 11 recite *inter alia*, "calculating a self similarity ratio

[62] *Arrhythmia*, 958 F.2d at 1060; see also *In re Sherwood*, 613 F.2d 809, 819 (1981) (holding statutory claims to an apparatus for analyzing seismic signals including mathematically described means for "sonogramming", "dividing", and "plotting").
[63] *Id.*
[64] *Id.*
[65] *Alappat*, 33 F.3d at 1526.
[66] *Schafly v. Caro-Kann Corp.*, Civ. App. 98-1005 (Fed. Cir. Apr. 29, 1998) (unpublished).
[67] *Id.*

value, representing a periodicity characteristic, and an autocorrelation coefficient value, representing a spectral characteristic, for an input signal segment." Claims 1 and 11 further recite *inter alia*, "determining whether said input signal segment is speech or voice-band data based on" at least one of these values. Therefore, the claims recite ***transforming*** the data of the input ***signal*** using "calculating" and "determining" steps, similar the to "converting," "applying," "determining," and "comparing" steps of *Arrhythmia*.[68] Moreover, the input signal is ***transformed*** into a value ***representing "whether said input signal segment is speech or voice-band data***," similar to the value derived in *Arrhythmia*, which represented "***a signal related to the patient's heart activity***."[69] Thus, the value in claim 1 also represents a non-abstract value – speech and voice-band data.

Further, claim 11 recites a "calculating means" and a "determining means," similar to *Arrhythmia* and *Schlafly*, with the present application disclosing that example embodiments may be implemented by a variety of ***physical*** network interface devices such as an "ATM trunking device or an IP-telephone network gateway" in which the speech/VBD discriminator unit 100[70] may be implemented in a variety of ways such as in "a Digital Signal Processor (DSP), in programmable logic devices, in application specific integrated circuits,

[68] *Arrhythmia*, 958 F.2d at 1059.
[69] *Id.*
[70] See Fig. 1 of the originally filed application.

or a combination of such devices."[71] Thus, the data clearly undergoes a physical transformation according to the "calculating" and "determining" means of claim 11.

Hence, while a data transformation is not a necessary requirement to illustrate a practical application, the claims do transform the input signal into a different, non-abstract value representing whether the input signal segment is speech or voice-band data, similar to the values in *Arrhythmia* and *Schlafly*. Thus, as claims 1-21 recite subject matter that involves the transformation of data, claims 1-21 do provide a practical application that is statutory. Appellant, therefore, respectfully requests that the rejection to claims 1-21 under 35 U.S.C. § 101 be withdrawn.

2. Regardless of whether the subject matter of claims 1-21 involves a physical transformation, the subject matter of claims 1-21 still provides a practical application by producing a useful, concrete, and tangible result and therefore is directed towards a practical application under 35 U.S.C. § 101.

Even if a claim does not involve a physical transformation, the claim is still statutory if the claim provides a practical application that produces a "***useful, tangible and concrete result***" [emphasis added].[72] After all, transformation is only one of many ways to show a practical application under 35 USC § 101.[73] In determining whether the claim is for a practical

[71] See page 4, lines 20-28 of the originally filed application.
[72] *AT&T Corp*, 172 F 3d at 1360-61.
[73] See *AT&T*, 172 F.3d at 1358-59.

application, "the focus is not on whether the steps taken to achieve a particular result are useful, tangible and concrete, but rather that the ***final result*** achieved by the claimed invention is 'useful, tangible and concrete'"[74]

Alappat, *State Street*, and *AT&T* clearly show that the phrase "useful, concrete and tangible" refers to a single unified test.[75] In addition, the courts give a number of examples of a "useful, concrete and tangible result:" a "share price" which represents "discrete dollar amounts,[76] a "PIC indicator" which "represents information about the call recipient's telephone carrier,"[77] and a "trace" representing a waveform.[78] All of the above values are produced by a mathematical algorithm. Moreover, a physical substrate is only implicit in the § 112 ¶ 6 construction of the *State Street* claim,[79] and completely absent from the body of the *AT&T* claim.[80] However, even a physical structure would not have been necessary in *State Street*, which states that a "useful result" may be "expressed in numbers, such as price, profit, percentage, cost, or loss."[81] This is because, as the court states, "the essential inquiry is to determine whether the subject matter of the claim has "practical utility"[82] or "produces a useful

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[74] *See State Street Bank*, 149 F.3d at 1368 (holding the transformation of data to produce a final share price a practical application of a mathematical algorithm because it produces "a useful, concrete and tangible result").
[75] *AT&T*, 172 F.3d at 1357-59.
[76] *State Street Bank*, 149 F.3d at 1368.
[77] *AT&T*, 172 F.3d at 1354.
[78] *Alappat*, 33 F.3d at 1526.
[79] *State Street Bank*, 149 F.3d at 1371.
[80] *AT&T*, 172 F.3d at 1354.
[81] *State Street Bank*, 149 F.3d at 1375.
[82] *Id.*

result."[83] In fact, the scope of 35 USC § 101 is the same "regardless of the form - machine or process – in which a particular claim is drafted."[84] For process claims, "a structural inquiry is unnecessary."[85]

In *AT&T*, the claimed invention is directed to a "message record for long-distance telephone calls that is enhanced by adding a primary interexchange carrier ('PIC') indicator."[86] The PIC indicator "aids long-distance carriers in providing differential billing treatment for subscribers, depending upon whether a subscriber calls someone with the same or a different long-distance carrier."[87] More specifically, the claimed invention is directed towards "the addition of a data field into a standard message record to indicate whether a call involves a particular PIC."[88]

For instance, independent method claim 1 of the *AT&T* patent[89] recites the step of "***generating a message record*** for an interexchange call between an originating subscriber and a terminating subscriber," and the step of "***including***, in said message record, a primary interexchange carrier (PIC) ***indicator*** having a value which is a function of whether or not the interexchange carrier associated with said terminating subscriber is a

[83] *AT&T*, 172 F.3d at 1360.
[84] *Id.* at 1357-58.
[85] *Id.* at 1359.
[86] *Id.* at 1353.
[87] *Id.*
[88] *Id.* at 1354.
[89] See US Pat. No. 5,333,184.

predetermined one of said interexchange carriers. [Emphasis added]"[90] Thus, claim 1 of the *AT&T* patent "adds a PIC indicator whose value depends upon the call recipient's PIC."[91]

In AT&T, the court noted that the "claimed process employs subscribers' and call recipients' PICs as ***data***, applies ***Boolean algebra*** to those data to determine the value of the PIC indicator, and applies that value through switching and recording mechanisms to create a ***signal useful for billing purposes***" [Emphasis added]. That the PIC indicator was simply a ***number*** "derived using a ***simple mathematical principle*** (p and q)" was irrelevant. Instead, the court focused on the fact that the "PIC indicator represents information about the call recipient's PIC, a useful, non-abstract result that facilitates differential billing of long-distance calls made by an IXC's subscriber," in determining that the "claimed process comfortably falls within the scope of Section 101."[92]

In the present application, claims 1-21 relate to "discriminating speech from voice-band data in a communication network." Moreover, independent claims 1 and 11 of the present application recite *inter alia*, "***calculating a self similarity ratio value***, representing a ***periodicity characteristic***, and an ***autocorrelation coefficient value***, representing a ***spectral characteristic***, for an input signal segment."

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[90] *AT&T*, 172 F.3d at 1354.
[91] *Id.*
[92] *AT&T*, 172 F.3d at 1358; See also *Arrhythmia*, 958 F.2d at 1060 ("That the product is numerical is not a criterion of whether the claim is directed to statutory subject matter").

Thus, like the claims in *AT&T*, which disclosed "including" an "indicator having a ***value***,"[93] independent claims 1 and 11 of the present application recite *inter alia*, "***calculating a self similarity ratio value***, representing a ***periodicity characteristic***, and an ***autocorrelation coefficient value***, representing a ***spectral characteristic***, for an input signal segment."

Further the "value" in *AT&T* is "derived using a simple mathematical principle (p and q)."[94] Whereas, the "self similarity ratio value" and "autocorrelation coefficient value" in claims 1 and 11 are generally calculated using even more complex mathematical principles.[95]

As recited in claim of 1 of AT&T, the "value" is a "function of whether or not the interexchange carrier associated with said terminating subscriber is a predetermined one of said interexchange carriers."[96] The court in *AT&T* found the ***function*** of the "value," which "facilitates differential billing of long-distance," to "produce a useful, concrete, tangible result" that "comfortably falls within the scope of Section 101."[97]

Claims 1 and 11 of the present application recite *inter alia*, "determining whether said input signal segment is speech or voice-band data based on said at least one of said self similarity value and said autocorrelation coefficient value." Also, the present application discloses that it "is well known that the

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[93] *AT&T*, 172 F.3d at 1354.
[94] *AT&T*, 172 F.3d at 1358; See also *Arrhythmia*, 958 F.2d at 1060 ("That the product is numerical is not a criterion of whether the claim is directed to statutory subject matter").
[95] See equations 3-7 at pages 6-8 of the originally filed application.
[96] *AT&T*, 172 F.3d at 1354.
[97] *Id.* at 1358.

ability to discriminate between speech and voice-band data (VBD) signals, e.g., originating from a modem or facsimile machine, in a communication network can improve network efficiency and/or ensure Quality of Service requirements."[98] As such, the subject matter of claim 1 and 11 clearly produces "a useful, concrete, tangible result" that also "comfortably falls within the scope of Section 101,"[99] similar to *AT&T.*

Thus, as claims 1-21 recite subject matter that produces "a useful, concrete, tangible result," claims 1-21 provides a practical application that is statutory. Appellant, therefore, respectfully requests that the rejection to claims 1-21 under 35 U.S.C. § 101 be withdrawn.

3. Moreover, a "useful, concrete, and tangible result" is equivalent to the utility requirement of 35 USC § 101, which the subject matter of claims 1-21 satisfies, thus making the subject matter of claims 1-21 statutory under 35 USC § 101.

The court has essentially equated the phrase "useful, concrete and tangible" to the "practical utility" test of § 101.[100] For instance, the courts repeatedly juxtapose the phrase "useful, concrete and tangible" with one of the words "useful way,"[101] "useful,"[102] "useful end,"[103] "useful manner,"[104] "useful,

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[98] See page 1, lines 7-10 of the originally filed application.
[99] *AT&T,* 172 F.3d at 1358.
[100] *AT&T,* 172 F.3d at 1352.
[101] *State Street,* 149 F.3d at 1373.
[102] *Alappat,* 33 F.3d at 1544.
[103] AT&T, 172 F 3d at 1357.
[104] *Id.*

non-abstract result,"[105] "useful application"[106] and "useful result."[107] The phrase "useful, concrete and tangible" and some variation of the word "useful" are even switched back and forth between successive sentences, or sometimes within a single sentence, to demonstrate that the two are synonymous.[108]

As for the utility standard under 35 USC § 101, the general consensus is that the threshold for utility is relatively low and rarely an issue for mechanical or electrical inventions.[109] In *Juicy Whip*, the court stated that "the threshold of utility is not high: an invention is 'useful' under section 101 if it is capable of providing some ***identifiable benefit***" [Emphasis added].[110] Even if that utility is performed poorly, the claimed invention is still patentable.[111] In fact, only inventions which are "totally incapable of achieving a useful result" are considered to lack utility.[112]

In the present application, claims 1-10 relate to a method of discriminating speech from voice-band data in a communication network. Claims 11-21 relate to an apparatus for discriminating speech from voice-band data in a communication network. Moreover, independent claims 1 and 11 recite *inter alia*, "determining whether said input signal segment is speech or voice-band data." Also, as the present application discloses, it "is well known

[105] *AT&T*, 172 F 3d at 1358.
[106] *Id.*
[107] *AT&T*, 172 F 3d at 1360; *State Street*, 149 F.3d at 1374.
[108] See *AT&T Corp*, 172 F 3d at 1357-58, 1360, for some examples.
[109] *See Juicy Whip, Inc. v. Orange Bang, Inc.*, 185 F.3d 1364, 1366 (Fed. Cir. 1999).
[110] *Id.*
[111] *See Brooktree Corp. v. Advanced Micro Devices, Inc.*, 977 F.2d 1555, 1571 (Fed. Cir. 1992).
[112] *Id.*

that the ability to discriminate between speech and voice-band data (VBD) signals, e.g., originating from a modem or facsimile machine, in a communication network can improve network efficiency and/or ensure Quality of Service requirements."[113]

As such, discriminating speech from voice-band data in a communication network plainly provides an identifiable benefit, thus satisfying the utility requirement under 35 U.S.C. § 101. Therefore, the subject matter of claims 1-21 clearly produces a useful, concrete, and tangible result and is thus statutory under 35 U.S.C. § 101. Appellant, therefore, respectfully requests that the rejection to claims 1-21 under 35 U.S.C. § 101 be withdrawn.

C. As claim 11 includes means-plus-function elements, claim 11 is directed to statutory subject matter, regardless of whether apparatus claim 11 also includes a mathematical algorithm.

The case law with respect to interpreting means-plus-function claims is well settled.[114] For example, as explained in *Donaldson* and affirmed by *Alappat* , ***the PTO is not exempt*** from following the statutory mandate of 35 USC § 112, ¶ 6, which states the following:[115]

> An element in a claim for a combination may be expressed as a means or step for performing a specified function without the

[113] See page 1, lines 7-10 of the originally filed application.
[114] *See e.g. Alappat*, 33 F.3d at 1526; *In re Bond*, 910 F.2d 831, 833 (Fed. Cir. 1990); *In re Iwahashi*, 888 F.2d 1370, 1375 (Fed. Cir. 1990); *In re Meyer*, 688 F.2d 789, 796 (CCPA 1982); *In re Knowlton*, 481 F.2d 1357, 1366 (CCPA 1973); *In re Foster*, 438 F.2d 1011, 1014 (CCPA 1971); *In re Bernhart*, 417 F.2d 1395, 1399 (CCPA 1969); *In re Prater*, 415 F.2d 1393, 1406 (CCPA 1969). *See also generally* R. Carl Moy, *The Interpretation of Means Expressions During Prosecution*, 68 JPOS 246 (1986)
[115] *Alappat*, 33 F.3d at 1540 *citing In re Donaldson*, 16 F.3d 1189, 1193 (Fed. Cir. 1994).

> recital of structure, material, or acts in support thereof, and such claim *shall be construed* to cover the corresponding structure, material, or acts described in the specification and equivalents thereof. [Emphasis added][116]

As noted above, in *Alappat*, the court found an independent claim written in a mean-plus-function format to be statutory under 35 USC § 101 where the claim was related to a method for creating a smooth waveform display in a digital oscilloscope and included "means for determining" and "means for normalizing."[117] In *Alappat*, the court found the following terms in the specification to provide sufficient structure for the means language recited in the claims: "machine," "circuit," "shifters" and "read only memory (ROM)."[118] From these terms, the court was able to determine that the claim "unquestionably recites a machine, or apparatus."[119] As a result, the court determined that an inquiry as to whether the subject matter of the claims falls within a judicially crated exception to §101 such as the "mathematical algorithm" exception to be superfluous.[120]

Further the court reaffirmed the *Alappat* decision in *Schlafly*, where the means-plus-function claim included terminals encoding and decoding according a numerical calculation algorithm.[121] Specifically, the court stated in *Schlafly* that "claims written in means-plus-function format contain ***statutory***

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[116] 35 U.S.C. Section 112, paragraph 6 (1988).
[117] *Alappat*, 33 F.3d at 1526.
[118] *Id.* at 1541.
[119] *Id.*
[120] *Id.* at 1543.
[121] *Schafly v. Caro-Kann Corp.*, Civ. App. 98-1005 (Fed. Cir. Apr. 29, 1998) (unpublished).

subject matter even if functional phrases of the means limitations recite mathematical calculations."[122]

In the present application, Claim 11 relates to an "***apparatus*** for discriminating speech from voice-band data in a communication network." Claim 11 further recites a "calculating means" and a "determining means." The present application also states that example embodiments may be implemented by a variety of ***physical*** network interface ***devices*** such as an "ATM trunking device or an IP-telephone network gateway."[123] These devices include the speech/VBD discriminator unit 100 (as shown in Fig. 1), which is the "calculating means" and "determining means" of claim 11, and may be implemented in a variety of ways such as in "a Digital Signal Processor (DSP), in programmable logic devices, in application specific integrated circuits, or a combination of such devices."[124] Therefore, as apparatus claim 11 includes "means" which have corresponding structural support in the present application, apparatus claim 11 falls under the category of a "machine," and is thus statutory under 35 USC § 101.

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[122] *Id.*
[123] See page 4, lines 20-28 of the originally filed application.
[124] See page 4, lines 20-28 of the originally filed application.

D. Even if the USPTO disagrees with Appellant's assertion that claims 1-21 are statutory under 35 USC § 101, the USPTO has still failed to provide a prima facie case of unpatentability.

The "[E]xaminer bears the initial burden ... of presenting a prima facie case of unpatentability."[125] Thus, if the Examiner believes that the claimed subject matter falls outside all of the statutory categories, then the Examiner should identify and explain in the record the reasons why a claim is for an abstract idea with no practical application.

However, in this case, the Examiner simply states that under 35 U.S.C. § 101, "claims 1-21 define non-statutory processes because they merely manipulate an abstract idea (the mathematical manipulation of data (voice information and text)) without a claimed limitation to produce a useful, concrete, tangible result."[126] The Examiner does not elaborate further as to why the claimed subject matter does not fall into a statutory category or any of its exceptions. Specifically, the Examiner has not provided any factual support for the assertion that claims 1-21 do "not produce a useful, concrete tangible result."[127]

Thus, the USPTO has not even provided any factual support to support that claims 1-21 are non-statutory under 35 U.S.C. § 101. Instead, the Examiner merely cites case law and then makes the conclusory statement that

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[125] See *In re Oetiker*, 977 F.2d 1443, 1445, 24 USPQ2d 1443, 1444 (Fed. Cir. 1992).
[126] See page 2 of the Final Office Action mailed December 5, 2007.
[127] See page 4 of the Final Office Action mailed December 5, 2007.

the "current claim scope does not produce a useful, concrete, tangible output."[128] Therefore, Appellant respectfully requests that the rejections to claims 1-21 under 35 U.S.C. § 101 be withdrawn.

[128] See page 4 of the Final Office Action mailed December 5, 2007.

VIII. CONCLUSION:

In view of the detailed discussion provided above regarding the pending rejections, Appellant respectfully submits that the bases for the rejections have been addressed and overcome, leaving the present application in condition for allowance. Therefore, Appellant respectfully requests the Board to reverse the Examiner's rejection of claims 1-21.

If necessary, the Director of the USPTO is hereby is authorized in this, concurrent, and future replies, to charge payment or credit any overpayment to Deposit Account No. 08-0750 for any additional fees required under 37 C.F.R. § 1.16 or under 37 C.F.R. § 1.17; particularly, extension of time fees.

Respectfully submitted,

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APPENDIX A

CLAIMS

Claims 1-21 on Appeal:

1. A method of discriminating speech from voice-band data in a communication network, comprising:

calculating a self similarity ratio value, representing a periodicity characteristic, and an autocorrelation coefficient value, representing a spectral characteristic, for an input signal segment, wherein calculating the self similarity ratio value includes calculating a plurality of different self similarity ratio values and selecting the highest one of the plurality of different self similarity ratio values as the calculated self similarity ratio value; and

determining whether said input signal segment is speech or voice-band data based on said at least one of said self similarity value and said autocorrelation coefficient value.

2. The invention as defined in claim 1, wherein said input signal segment is a frame of *N* samples.

3. The invention as defined in claim 1, wherein

said calculating step calculates a first self similarity ratio value, corresponding to a first sample delay, as a first periodicity characteristic value; and

said determining step determines that said input signal segment is voice-band data if said first self similarity ratio value is greater than a first similarity threshold.

4. The invention as defined in claim 3, wherein

said calculating step calculates a second self similarity ratio value, corresponding to a second sample delay, as a second periodicity characteristic value, said second sample delay being greater than said first sample delay; and

said determining step determines that said input signal segment is speech if said second self similarity ratio value is greater than a second similarity threshold.

5. The invention as defined in 1, wherein

said calculating step calculates a first autocorrelation coefficient as a first spectral characteristic value; and

said determining step determines that said input signal segment is voice-band data if said first autocorrelation coefficient is less than a first autocorrelation threshold, and that said input signal segment is speech if said first autocorrelation coefficient is greater than a second autocorrelation threshold, said second autocorrelation threshold being greater than said first autocorrelation threshold.

6. The invention as defined in claim 5, wherein

said calculating step calculates second and third autocorrelation coefficients as second and third spectral characteristic values respectively, and

said determining step determines that said input signal segment is voice-band data if said second autocorrelation coefficient is less than a third autocorrelation threshold or said third autocorrelation coefficient is less than a fourth autocorrelation threshold.

7. The invention as defined in claim 6, wherein

said determining step determines that said input signal segment is voice-band data if a sum of said second autocorrelation coefficient and said third autocorrelation coefficient is less than a fifth autocorrelation threshold.

8. The invention as defined in claim 1, wherein

said calculating and determining steps are performed for a plurality of input signal segments in accordance with a sequential decision logic sequence which designates input signal segments as speech during a speech state and designates input signal segments as voice-band data during a voice-band data state.

9. The invention as defined in claim 8, wherein

said sequential decision logic sequence switches from said speech state to said voice-band data state when results of said determining step for a plurality of input signal segments indicate that said speech state is erroneous, and

said sequential decision logic sequence switches from said voice-band data state to said speech state when results of said determining step for a plurality of input signal segments indicate that said voice-band data state is erroneous.

10. The invention as defined in claim 8, wherein

results of said determining step are weighted based on energy content of the corresponding input signal segment so that determination results for low energy input signal segments are given relatively low weight when determining whether to switch from said speech state to said voice-band data state or from said voice-band data state to said speech state.

11. An apparatus for discriminating speech from voice-band data in a communication network, comprising:

calculating means for calculating a self similarity ratio value, representing a periodicity characteristic, and an autocorrelation coefficient value, representing a spectral characteristic, for an input signal segment, wherein calculating the self similarity ratio value includes calculating a

plurality of different self similarity ratio values and selecting the highest one of the plurality of different self similarity ratio values as the calculated self similarity ratio value; and

determining means for determining whether said input signal segment is speech or voice-band data based on said at least one of said self similarity value and said autocorrelation coefficient value.

12. The invention as defined in claim 11, wherein said input signal segment is a frame of *N* samples.

13. The invention as defined in claim 11, wherein

said calculating means calculates a first self similarity ratio value, corresponding to a first sample delay, as a first periodicity characteristic value; and

said determining means determines that said input signal segment is voice-band data if said first self similarity ratio value is greater than a first similarity threshold.

14. The invention as defined in claim 13, wherein

said calculating means calculates a second self similarity ratio value, corresponding to a second sample delay, as a second periodicity characteristic value, said second sample delay being greater than said first sample delay; and

said determining means determines that said input signal segment is speech if said second self similarity ratio value is greater than a second similarity threshold.

15. The invention as defined in 11, wherein

said calculating means calculates a first autocorrelation coefficient as a first spectral characteristic value; and

said determining means determines that said input signal segment is voice-band data if said first autocorrelation coefficient is less than a first autocorrelation threshold, and that said input signal segment is speech if said first autocorrelation coefficient is greater than a second autocorrelation threshold, said second autocorrelation threshold being greater than said first autocorrelation threshold.

16. The invention as defined in claim 15, wherein

said calculating means calculates second and third autocorrelation coefficients as second and third spectral characteristic values respectively, and

said determining means determines that said input signal segment is voice-band data if said second autocorrelation coefficient is less than a third autocorrelation threshold or said third autocorrelation coefficient is less than a fourth autocorrelation threshold.

17. The invention as defined in claim 16, wherein

said determining means determines that said input signal segment is voice-band data if a sum of said second autocorrelation coefficient and said third autocorrelation coefficient is less than a fifth autocorrelation threshold.

18. The invention as defined in claim 11, wherein

said apparatus classifies a plurality of input signal segments as being either speech or voice-band data in accordance with a sequential decision logic sequence which designates input signal segments as speech during a speech state and designates input signal segments as voice-band data during a voice-band data state.

19. The invention as defined in claim 18, wherein

said apparatus, in accordance with said sequential decision logic sequence, switches from said speech state to said voice-band data state when results of said determining means for a plurality of input signal segments indicate that said speech state is erroneous, and

said apparatus, in accordance with said sequential decision logic sequence, switches from said voice-band data state to said speech state when results of said determining means for a plurality of input signal segments indicate that said voice-band state is erroneous.

20. The invention as defined in claim 18, wherein

said apparatus weights results of said determining means based on energy content of the corresponding input signal segment so that determination results for low energy input signal segments are given relatively low weight when said apparatus judges whether to switch from said speech state to said voice-band data state or from said voice-band data state to said speech state.

21. The method of claim 1, wherein said self similarity ratio is calculated based on more than one sample.

APPENDIX B - EVIDENCE SUBMITTED UNDER CFR 1.130, 1.131, OR 1.132

None.

APPENDIX C – RELATED APPEALS AND INTERFERENCES

A Notice of Appeal was filed on November 16, 2006 and an Appeal Brief was filed on February 16, 2006, arguing non-related, art-based rejections. In response to the Appeal Brief, a Non-final Office Action was mailed on June 22, 2007. No decision was rendered by the Board of Appeals to the best of Appellant's knowledge.

APPENDIX D – DECISIONS RENDERED BY THE COURT OR THE BOARD IN RELATED APPEALS AND INTERFERENCES

None.